

SECTION 07141
COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

0.1 DESCRIPTION OF WORK

- A.** Work Included: This Section specifies cold fluid-applied waterproofing.
- B.** Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 1. Section 02780 - UNIT PAVERS: Pavers.
 2. Section 05811 - ARCHITECTURAL JOINT SYSTEMS: Expansion-joint systems.
 3. Section 07131 - SELF-ADHERING SHEET WATERPROOFING.
 4. Section 07142 - HOT FLUID-APPLIED WATERPROOFING.
 5. Section 07170 - BENTONITE WATERPROOFING.

0.2 PERFORMANCE REQUIREMENTS

- A.** Provide waterproofing membrane that prevents the passage of water.

0.3 SUBMITTALS

- A.** Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
- B.** Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
- C.** Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- D.** Qualification Data: For Installer and for Testing and Inspection Agency.
- E.** Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
- F.** Test Reports: From Testing and Inspection Agency.

- G.** Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

0.4 QUALITY ASSURANCE

- A.** Installer Qualifications: A qualified installer who is authorized, approved, or licensed to install waterproofing manufacturer's products; and who is eligible to receive waterproofing warranty specified.
- B.** Hold Point - Mockups: Apply 100 square feet of waterproofing to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality.
1. If Engineer determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C.** Preinstallation Conference: Conduct conference at Project site to review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

0.5 DELIVERY, STORAGE, AND HANDLING

- A.** Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B.** Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- C.** Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D.** Protect stored materials from direct sunlight.

0.6 PROJECT CONDITIONS

- A.** Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or

when temperature is below 0 deg F. Do not apply waterproofing in snow, rain, fog, or mist.

- B.** Maintain adequate ventilation during application and curing of waterproofing materials.

0.7 WARRANTY

- A.** Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing and sheet flashings that do not comply with requirements or that do not remain watertight within specified warranty period.
1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/8 inch in width.
 2. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.
 3. Warranty Period: Five years after date of Substantial Completion.

PART 2 - PRODUCTS

0.1 ACRYLIC-METHYLMETHACRYLATE WATERPROOFING MATERIALS

- A.** General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.
1. Two Component Methyl Methacrylate Waterproofing: Acrylic based two-component spray-applied material by Sterling Lloyd Products or approved equal meeting requirements listed below:
- B.** Primer: 100% solvent-free reactive acrylic based, two component resin capable of a full cure in 40 minutes at 68 deg F (20 deg C). For steel surfaces, the primer shall contain zinc phosphate pigments.
- C.** Membrane: 100% solvent-free reactive, acrylic based, two component, spray-applied material. The membrane shall meet or exceed the following properties as related to laboratory-prepared samples tested at 68 deg F (20 deg C) and 24 hour cure where applicable:
1. Gel Time, 6-11 minutes.
 2. Cure Time, 30 minutes.
 3. Water Vapor Transmission, ASTM E96, 1.7 g/m²/day.
 4. Adhesion to Steel, ASTM D4541, 2.0 MPa (290 psi)

5. Adhesion to Concrete, ASTM D4541, 0.7 MPa (100 psi or failure of concrete).
6. Minimum Tensile Strength, ASTM D638, 6.5 MPa (940 psi)
7. Minimum Elongation at Break, ASTM D638, Method A, 80% Die C
8. Low Temperature Flexibility, CAN CGSB 37.50 M89, Pass 6.5 mm (1/4") Mandrel at -25 deg C.
9. Crack Bridging, ASTM C836-89A, Pass @ 10 cycles, 1/8 inch (3.2 mm), -15 deg F
10. Tack Coat Material (for Bitumen Concrete Overlay areas only): Modified bitumen adhesive.

0.2 UNMODIFIED POLYURETHANE OR LATEX RUBBER WATERPROOFING MATERIALS

- A.** General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.
 - 1. Two-Component Unmodified Polyurethane or Latex-Rubber Waterproofing: Comply with ASTM C 836. Products that may be incorporated into the work include, but are not limited, to those manufactured by Carlisle Corporation.
- B.** Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.
- C.** Sheet Flashing: 50-mil minimum, nonstaining uncured sheet neoprene.
 - 1. Adhesive: Manufacturer's recommended contact adhesive.
- D.** Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.
- E.** Sealants and Accessories: Waterproofing manufacturer's recommended sealants and accessories.
 - 1. Backer Rod: Closed-cell polyethylene foam.
- F.** Protection Course at Unmodified Polyurethane or Latex-Rubber Waterproofing: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. Thickness: 1/8 inch nominal.
 - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

2.4 POLYUREA SPRAY APPLIED WATERPROOFING MATERIALS

- A.** General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.
 - 1. Two Component Polyurea Waterproofing: Two-component spray-applied material by Bridge Preservation or equal meeting the requirements listed below.
- B.** Primer: A single or double coat of spray, roller or brush-applied primer as required for all steel and concrete surfaces. The primer shall cure tack-free before application of the waterproofing membrane
- C.** Membrane: 100% solvent-free reactive, polymer based, two component, spray-applied material. The membrane shall meet or exceed the following properties as related to laboratory-prepared samples tested at 68 deg F (20 deg C) and 24 hour cure where applicable:
 - 1. Gel Time, < 11 minutes.
 - 2. Cure Time, 30 minutes.
 - 3. Water Vapor Transmission, ASTM E96, 1.7g/m²/day.
 - 4. Adhesion to Steel, ASTM D4541, 2.0 MPa (290 psi)
 - 5. Adhesion to Concrete, ASTM D4541, 1.0 MPa (150psi or failure of concrete).
 - 6. Minimum Tensile Strength, ASTM D638, 6.5 MPa (940 psi)
 - 7. Minimum Elongation at Break, ASTM D638, Method A, 80% Die C
 - 8. Crack Bridging, ASTM C836-89A, Pass @ 10 cycles, 1/8 inch (3.2 mm), -15 deg F
 - 9. Tack Coat Material (for Bitumen Concrete Overlay areas only): Modified bitumen adhesive.
- D.** Expansion Joints: Pre-molded, seamless expansion joints supplied by the waterproofing manufacturer.

0.50 Asphaltic Protection Board: Protection Board shall meet the requirements of AREMA Chapter 29, section 2.4.3.

PART 3 - EXECUTION

0.1 EXAMINATION

- A.** Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

0.2 SURFACE PREPARATION

- A.** Clean and prepare substrate according to manufacturer's written recommendations and as specified in sections 3.5, 3.6, or 3.7 as appropriate. Provide clean, dust-free, and dry substrate for waterproofing application.
- B.** Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.
- C.** Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D.** Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- E.** Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

0.3 PREPARATION AT TERMINATIONS AND PENETRATIONS

- A.** Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.
- B.** Prime substrate, unless otherwise instructed by waterproofing manufacturer.
- C.** Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.

1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

0.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 1. Comply with ASTM C 1193 for joint-sealant installation.
 2. Apply bond breaker between sealant and preparation strip.
 3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches along each side of joint. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat.
- B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

0.5 ACRYLIC-METHYLMETHACRYLATE INSTALLATION

WATERPROOFING

- A. Immediately prior to the application of any components of the System the surface shall be dry and any remaining dust or loose particles shall be removed using clean, dry oil free compressed air or industrial vacuum.
- B. Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the System shall be continued up the vertical as necessary.
- C. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer.
- D. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.
- E. Primer: One coat with an overall coverage rate of 3.0-4.3 m²/l (125-175 ft²/gal). All components shall be measured and mixed in accordance with the Manufacturer's recommendations. The primer shall cure tack-free before application of the waterproofing membrane. Porous concrete may require a second coat of primer should the first coat be absorbed. The primer shall be applied using a roller or by a single component spray system approved for use by the Manufacturer. If required by site conditions, brush application shall be allowed.

- F. Membrane: Two coats, each with a nominal wet film thickness of 60 mils (1.5 mm) per coat, to achieve an overall coverage rate of 13.4 ft²/gal (0.33 m²/l). The membrane shall be comprised of two liquid components, A and B, and a Hardener Powder which is to be added to Component B in accordance with the Manufacturer's recommendations. If required by site conditions, the membrane shall be applied by brush, gauge rake or trowel. The substrate shall be coated in a methodical manner. Checks for wet film thickness shall be carried out typically once every 100 ft² (9 m²).
- G. Tack Coat for Bituminous Concrete Wearing Surfaces Only: The membrane should be fully cured in accordance with the manufacturer's recommendations prior to the application of a proprietary tack coat that forms an integral part of the waterproofing system. The membrane to be coated shall be clean and free from loose debris, moisture, or other contaminants. The tack coat shall be applied in accordance with the manufacturer's recommendations. During paving, a light soap spray or other approved treatment by the membrane manufacturer should be applied to the paving equipment wheels when necessary to prevent removal of the tack coat. The use of balloon tire paving vehicle is recommended.
- H. Repairs: If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the System. The damaged area shall be cut back to sound materials and wiped with solvent (e.g. acetone) up to a width of at least 4 inch (100 mm) on the periphery, removing any contaminants. The substrate shall be primed as necessary, followed by the application of the membrane. A continuous layer shall be obtained over the substrate with a 4 inch (100 mm) overlap onto existing membrane. Where the membrane is to be joined to existing cured material and at day joints, the new application shall overlap the existing one by at least 4 inch (100 mm). No preparation shall be necessary unless the existing materials are contaminated with tack coat or dirt in which case the repair/overlap shall first be wiped with solvent (e.g. acetone).

0.6 UNMODIFIED POLYURETHANE OR LATEX RUBBER WATERPROOFING APPLICATION

- A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply primer over prepared substrate.
- D. Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or two coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 3. Verify wet film thickness of waterproofing every 100 sq. ft.
- E. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.

0.7 POLYUREA WATERPROOFING INSTALLATION

- A. Prepare concrete surfaces to SSPC SP13/NACE No. 6, and metal surfaces to SSPC SP10
- B. ***Immediately prior to the application of any components of the System the surface shall be dry and any remaining dust or loose particles shall be removed using clean, dry oil free compressed air or industrial vacuum.***
- C. ***Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the System shall be continued up the vertical as necessary.***
- D. ***The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer.***
- E. ***A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.***
- F. ***Primer: One coat with an overall coverage rate of 130-200 ft²/gal. Provide the thickness as required to meet performance requirements in Section 2.4. All components shall be measured and mixed in accordance with the Manufacturer's recommendations. The primer shall cure tack-free before application of the waterproofing membrane. Porous concrete may require a second coat of primer should the first coat be absorbed. The primer shall be applied methods and equipment specified by the Manufacturer.***
Membrane: Two coats, each with a nominal wet film thickness of 60 mils (1.5 mm) per coat, to achieve an overall coverage rate of 13.4 ft²/gal (0.33 m²/l), or as directed by manufacturer to achieve a final minimum DFT of 100 mils.. Only heated, plural component spray equipment approved by the manufacturer shall be used. The substrate shall be coated in a methodical manner. Checks for wet film thickness shall be carried out typically once every 100 ft² (9 m²).

- G. Expansion Joints: Use only preformed, manufacturer supplied expansion joints.**
- H. Tack Coat for Bituminous Concrete Wearing Surfaces Only: The membrane should be fully cured in accordance with the manufacturer's recommendations prior to the application of a proprietary tack coat that forms an integral part of the waterproofing system. The membrane to be coated shall be clean and free from loose debris, moisture, or other contaminants. The tack coat shall be applied in accordance with the manufacturer's recommendations. During paving, a light soap spray or other approved treatment by the membrane manufacturer should be applied to the paving equipment wheels when necessary to prevent removal of the tack coat. The use of balloon tire paving vehicle is recommended.**
- I. Repairs: If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the System. Repair shall be carried out in accordance with the manufacturer's written repair procedures.**

0.8 FIELD QUALITY CONTROL

- A. Adhesion Tests:** Conduct in accordance with ASTM D4541 to confirm adequate surface preparation . Conduct a minimum of 3 tests and one additional for every 1000 square feet installed.
- B. Membrane Thickness:** Check every 100 square feet using a gauge pin standard comb-type thickness gauge.
- C. Coverage Rate:** Monitored by checking quantity of materials used against the area covered.
- D. Any additional testing required by system manufacture to ensure product will meet performance criteria listed in Section 2.**
- E. Flood Testing:** Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
 2. Flood each area for 24 hours.
 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight. Repair procedures shall be in strict accordance with manufacturer's recommendations.

- F. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

0.9 CURING, PROTECTING, AND CLEANING

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Install 2 or more layers of asphaltic hardboard as required to achieve a minimum of $\frac{3}{4}$ " thickness. Stagger the panel joints.
- C. Protect waterproofing from damage and wear during remainder of construction period.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

PART 4 - MEASUREMENT AND PAYMENT

0.1 MEASUREMENT

- A. Cold fluid-applied waterproofing will be measured as per square foot complete in place, including all preparation, accessories and incidentals.

0.2 PAYMENT

- A. Payment for cold fluid-applied waterproofing will be made at the Contract unit price for the quantities as specified above.

0.3 PAYMENT ITEMS

ITEM NO.	DESCRIPTION	UNIT
0710.001	COLD FLUID-APPLIED WATERPROOFING	SF

END OF SECTION

NOTES TO THE DESIGNER

- A.** Any request to modify or waive the specification requirements listed below must be approved in writing from the MBTA Assistant General Manager for Design and Construction:
1. Methyl methacrylate ***or polyurea*** waterproofing is required for RR deck waterproofing.